# Goniophotometry Report

1_PHOT_NINETY-NINE-1650lmChip-2700K-Spreader-HoneycombLouvre_2303
www.factorylux.com

**Tested Light Source -** 1_PHOT_NINETY-NINE-1650lmChip-2700K-Spreader-HoneycombLouvre_2303

## Laboratory and Equipment

| | |
|---|---|
| Laboratory Owner and Location | Factorylux, Greenhill Mills, Hebden Bridge, HX7 5QF, UK |
| Goniospectrometer System and Type | BaseSpion – Type C, horizontal |
| Spectrometer Manufacturer and Model | Ibsen Photonics, Denmark – Freedom VIS (Custom Viso) |

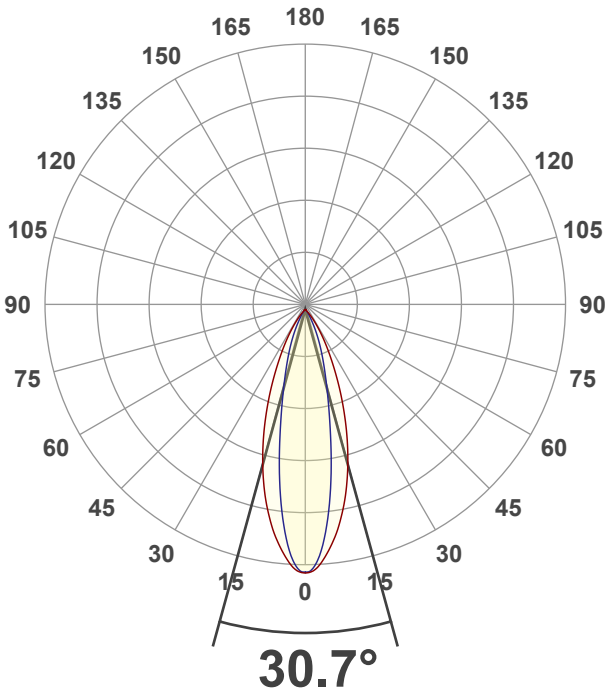
## Measurement Conditions

| | |
|---|---|
| Number of C-planes and Resolution | 32 planes – 11.25° |
| γ (gamma)-Resolution | 1° |
| Test Distance | 1.50 m |
| Input Power, Power and Displ. Factors | 14.6 W – PF 0.47 – DPF 0.78 |
| Input RMS Voltage and Current | 243 V – 0.127 A |
| Frequency of Input Power | 50 Hz |

## Main Light Measurement Results

| | |
|---|---|
| Output | 736 lm |
| Efficiency | 50 lm/W |
| Peak Intensity and Beam Angle | 1974 cd – 30.7° |
| Color Rendering Index | CRI 93.0 |

## Light Intensity Distribution



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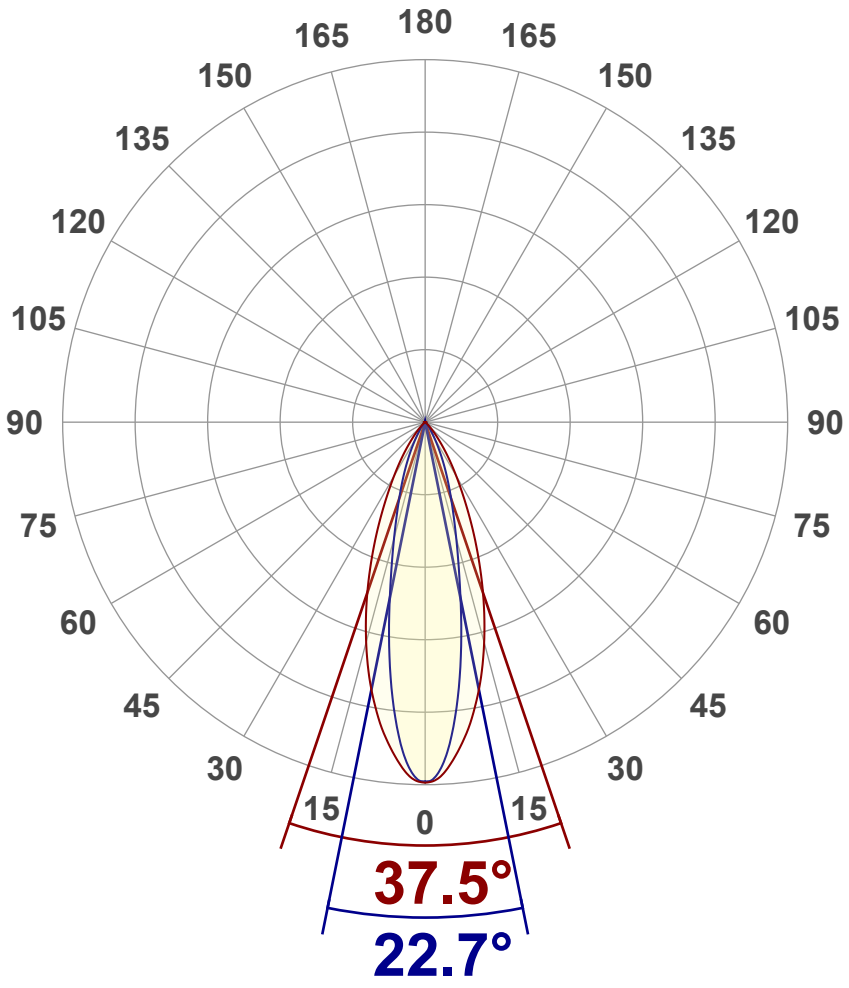
## Luminous Intensity diagram

Unit: 0-100% of peak intensity




## Main Values

| | |
|---|---|
| Output (total Lumen) | 736 lm |
| Peak Intensity | 1974 cd |
| Beam Angle (50%) | 30.7° |
| Beam Angle (90%) | 22.7° |
| Beam Angle (10%) | 44.2° |

## Cut-off Angle

| | |
|---|---|
| Average 2,5% | 79.3° |

## Field Angle

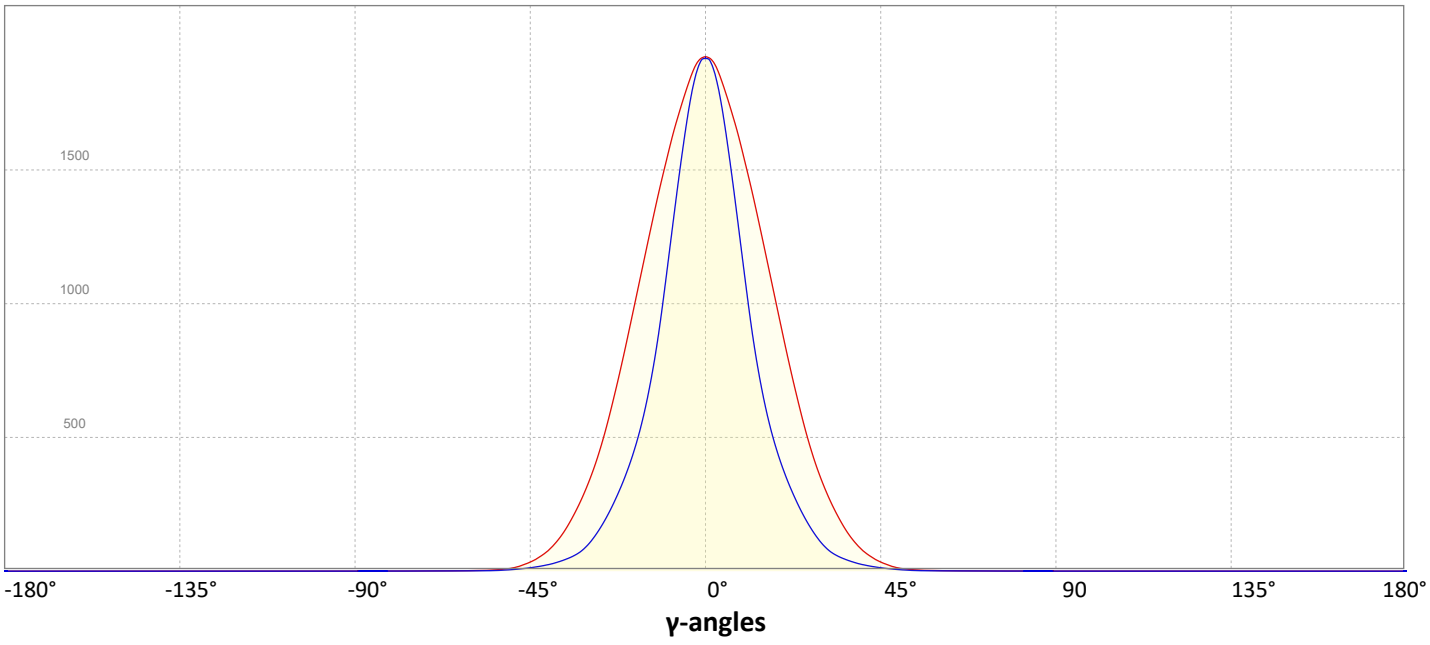
| | |
|---|---|
| Average 10% | 60.7° |

## Intensity Ratio

| | |
|---|---|
| In 120° cone | 99.6% |
| In 90° cone | 98.1% |

**C000-C180**
**C090-C270**

## Linear distribution diagram - Intensity (candela) vs γ-angle



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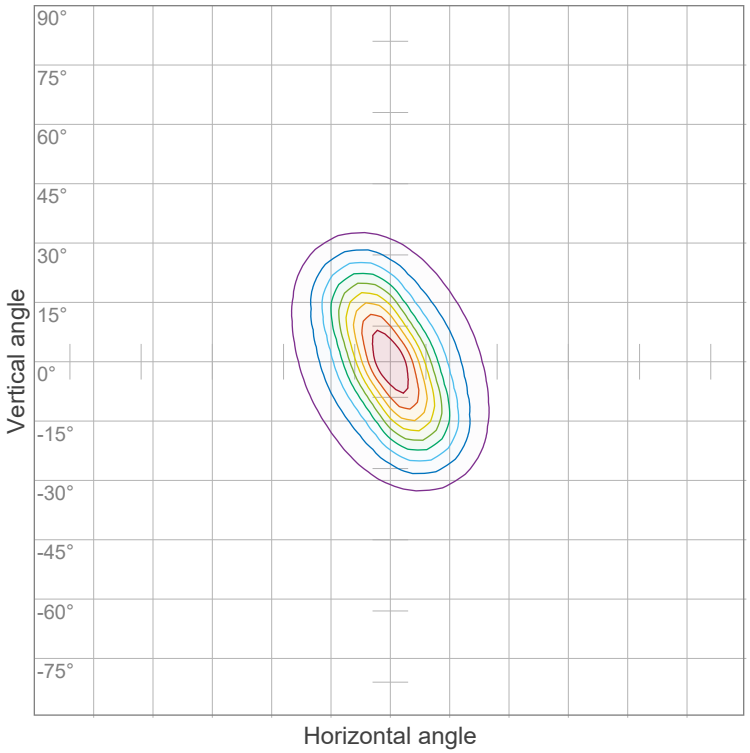
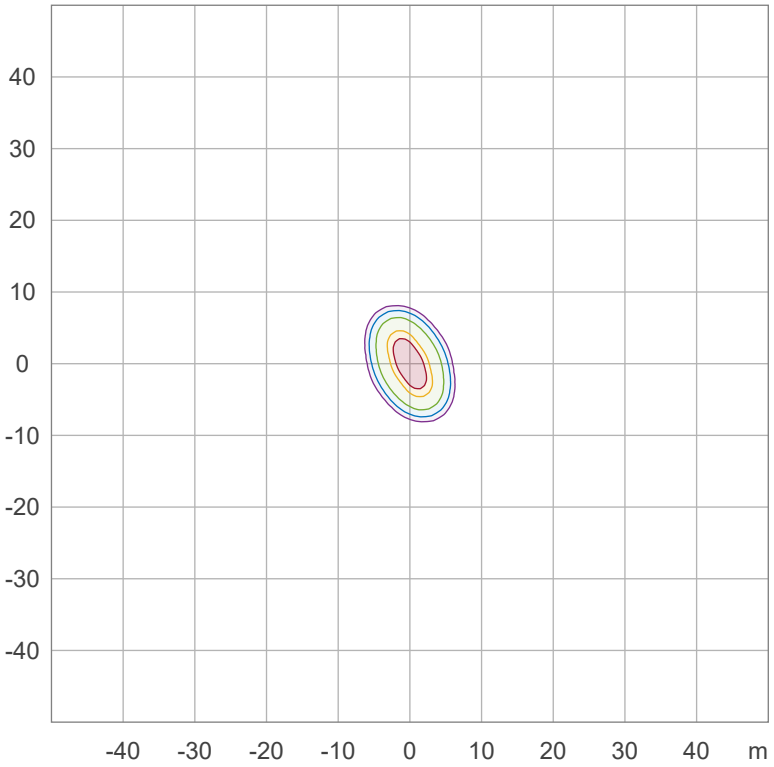
## Iso-intensity Diagram (Iso-candela)




| | | |
|---|---|---|
| 90 % | 1775.1 cd |
| 80 % | 1577.8 cd |
| 70 % | 1380.6 cd |
| 60 % | 1183.4 cd |
| 50 % | 986.1 cd |
| 40 % | 788.9 cd |
| 30 % | 591.7 cd |
| 20 % | 394.5 cd |
| 10 % | 197.2 cd |

Peak intensity: 1972.3 cd
Number of c-planes: 32

## Iso-illuminance Diagram (Iso-lux)




| | | |
|---|---|---|
| 50.0 % | 9.9 lx |
| 30.0 % | 5.9 lx |
| 10.0 % | 2.0 lx |
| 5.0 % | 1.0 lx |
| 3.0 % | 0.6 lx |

Peak illuminance: 19.7 lx
Mounting height: 10.0 m
Number of c-planes: 32

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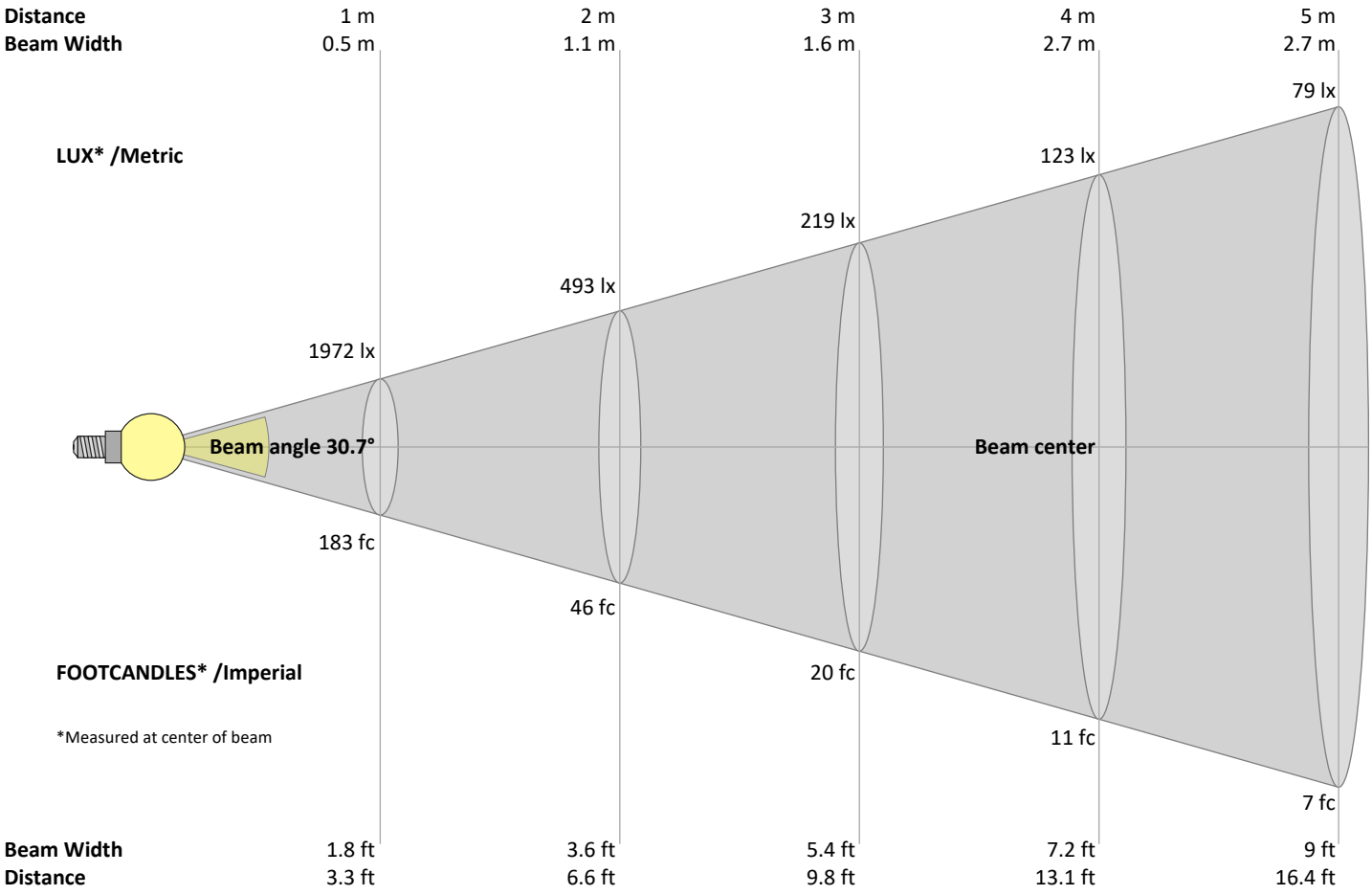
## Beam Details




**Beam intensities from 1 – 20 m**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.3 | 6.6 | 9.8 | 13.1 | 16.4 | 19.7 | 23 | 26.2 | 29.5 | 32.8 | 36.1 | 39.4 | 42.7 | 45.9 | 49.2 | 52.5 | 55.8 | 59.1 | 62.3 | 65.6 | ft |
| 1972 | 493 | 219 | 123 | 79 | 55 | 40 | 31 | 24 | 20 | 16 | 14 | 12 | 10 | 9 | 8 | 7 | 6 | 5 | 5 | lux |
| 183.2 | 45.8 | 20.4 | 11.5 | 7.3 | 5.1 | 3.7 | 2.9 | 2.3 | 1.8 | 1.5 | 1.3 | 1.1 | 0.9 | 0.8 | 0.7 | 0.6 | 0.6 | 0.5 | 0.5 | fc |

**Intensities in 0° c-plane**

| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1972 | 1954 | 1888 | 1798 | 1697 | 1579 | 1454 | 1319 | 1179 | 1038 | 898 | 764 | 638 | 523 | 424 | 342 | 271 | 211 | 159 | 117 | cd |
| 100% | 99% | 96% | 91% | 86% | 80% | 74% | 67% | 60% | 53% | 46% | 39% | 32% | 27% | 22% | 17% | 14% | 11% | 8% | 6% | of 0°val |

**Intensities in 90° c-plane**

| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1972 | 1929 | 1798 | 1602 | 1376 | 1140 | 917 | 735 | 592 | 479 | 389 | 314 | 248 | 191 | 143 | 104 | 76 | 58 | 45 | 34 | cd |
| 100% | 98% | 91% | 81% | 70% | 58% | 46% | 37% | 30% | 24% | 20% | 16% | 13% | 10% | 7% | 5% | 4% | 3% | 2% | 2% | of 0°val |

**Intensities in 180° c-plane**

| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1972 | 1954 | 1888 | 1798 | 1697 | 1579 | 1454 | 1319 | 1179 | 1038 | 898 | 764 | 638 | 523 | 424 | 342 | 271 | 211 | 159 | 117 | cd |
| 100% | 99% | 96% | 91% | 86% | 80% | 74% | 67% | 60% | 53% | 46% | 39% | 32% | 27% | 22% | 17% | 14% | 11% | 8% | 6% | of 0°val |

**Intensities in 270° c-plane**

| 0° | 2° | 4° | 6° | 8° | 10° | 12° | 14° | 16° | 18° | 20° | 22° | 24° | 26° | 28° | 30° | 32° | 34° | 36° | 38° | γ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1972 | 1929 | 1798 | 1602 | 1376 | 1140 | 917 | 735 | 592 | 479 | 389 | 314 | 248 | 191 | 143 | 104 | 76 | 58 | 45 | 34 | cd |
| 100% | 98% | 91% | 81% | 70% | 58% | 46% | 37% | 30% | 24% | 20% | 16% | 13% | 10% | 7% | 5% | 4% | 3% | 2% | 2% | of 0°val |

## Light Planning – UGR table

*Uncorrected, comprehensive UGR table according to 117-1995*

| **Reflectances** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ρ Ceiling | 70 | 70 | 50 | 50 | 30 | 70 | 70 | 50 | 50 | 30 |
| ρ Walls | 50 | 30 | 50 | 30 | 30 | 50 | 30 | 50 | 30 | 30 |
| ρ Floor | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| **Room size**<br>H = mounting height above eye level<br>X Y | **Viewed Crosswise**<br>(Viewing direction orthogonal to lamp length axis) | | | | | **Viewed Endwise**<br>(Viewing direction parallel to lamp length axis) | | | | |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| | | | | | | | | | | |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| | | | | | | | | | | |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| | | | | | | | | | | |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

**Variations with the observer position for the luminaire spacings, S:**

| | | |
|---|---|---|
| n/a | n/a | n/a |
| n/a | n/a | n/a |
| n/a | n/a | n/a |

UGR data could not be calculated due to missing/wrong symmetry. Goto Edit->Photometric->Corrections and select Correct asymmetry.

## Coefficients of Utilization

| Ceiling reflectance | 80 | | | 70 | | | 50 | | | 30 | | | 10 | | | 0 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wall reflectance | 70 | 50 | 30 | 10 | 70 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 0 |
| Floor reflectance | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 0 |
| RCR | (RCR: Room Cavity Ratio) | | | Room Values are expressed as percentage of Lumen delivered to the task surface | | | | | | | | | | | | | | |
| 0 | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 | 106 | 106 | 106 | 102 | 102 | 102 | 100 |
| 1 | 114 | 112 | 110 | 108 | 112 | 110 | 108 | 106 | 106 | 104 | 103 | 102 | 101 | 100 | 98 | 98 | 97 | 95 |
| 2 | 109 | 105 | 102 | 99 | 107 | 104 | 100 | 98 | 100 | 98 | 96 | 97 | 95 | 93 | 95 | 93 | 92 | 90 |
| 3 | 105 | 99 | 95 | 92 | 103 | 98 | 94 | 91 | 96 | 92 | 90 | 93 | 90 | 88 | 91 | 89 | 87 | 85 |
| 4 | 101 | 94 | 89 | 86 | 99 | 93 | 89 | 85 | 91 | 87 | 84 | 89 | 86 | 83 | 87 | 85 | 82 | 81 |
| 5 | 97 | 89 | 84 | 81 | 95 | 89 | 84 | 80 | 87 | 83 | 80 | 85 | 82 | 79 | 84 | 81 | 78 | 77 |
| 6 | 93 | 85 | 80 | 76 | 91 | 84 | 80 | 76 | 83 | 79 | 76 | 82 | 78 | 75 | 80 | 77 | 75 | 73 |
| 7 | 89 | 81 | 76 | 73 | 88 | 81 | 76 | 72 | 79 | 75 | 72 | 78 | 75 | 72 | 77 | 74 | 71 | 70 |
| 8 | 86 | 78 | 73 | 69 | 85 | 77 | 72 | 69 | 76 | 72 | 69 | 75 | 71 | 68 | 74 | 71 | 68 | 67 |
| 9 | 83 | 74 | 69 | 66 | 82 | 74 | 69 | 66 | 73 | 69 | 66 | 72 | 68 | 65 | 72 | 68 | 65 | 64 |
| 10 | 80 | 71 | 66 | 63 | 79 | 71 | 66 | 63 | 70 | 66 | 63 | 70 | 66 | 63 | 69 | 65 | 63 | 62 |

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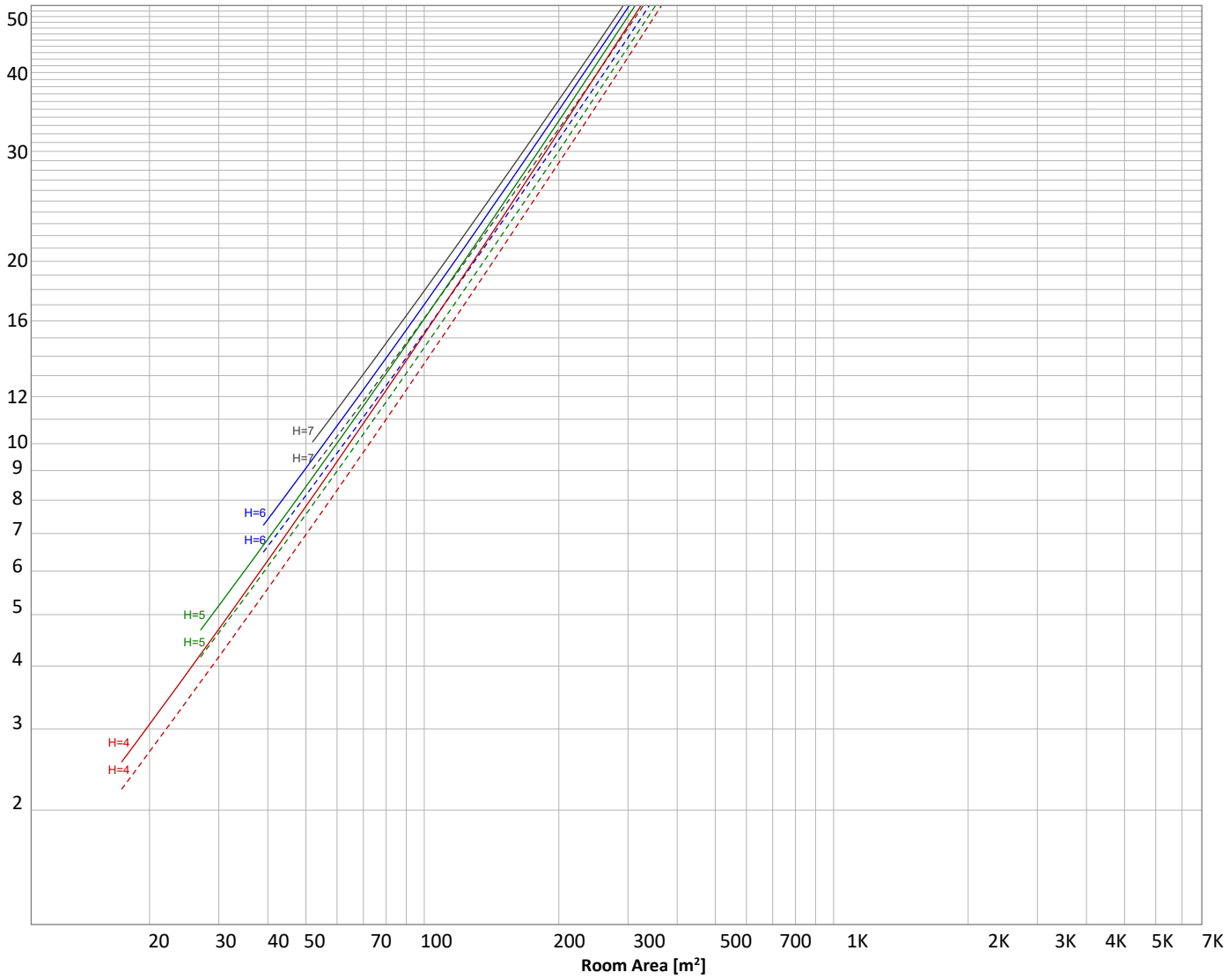
## Luminaire budgetary diagram

*Uncorrected, comprehensive UGR table according to 117-1995*

**LAMPS (number of lamps)**




**Conditions**

| | |
|---|---|
| H = Room height | Flux = 736 lm |
| $H_{down}$ = Lamp distance from ceiling = | 0.00 m |
| $H_{work}$ = Work area height from floor = | 0.00 m |
| $E_{work}$ = Average lux on work area = | 100 lx |

| | ρ(%) | | |
|---|---|---|---|
| Line type | Ceiling reflectance | Wall reflectance | Floor reflectance |
| ---------- | 70 | 50 | 30 |
| ———— | 50 | 30 | 20 |

## Zonal Lumen Summary

| 0°-10° | 10°-20° | 20°-30° | 30°-40° | 40°-50° | 50°-60° | 60°-70° | 70°-80° | 80°-90° |
|---|---|---|---|---|---|---|---|---|
| 156 lm | 268 lm | 196 lm | 85.7 lm | 23.6 lm | 4.00 lm | 1.18 lm | 0.633 lm | 0.458 lm |

| 90°-100° | 100°-110° | 110°-120° | 120°-130° | 130°-140° | 140°-150° | 150°-160° | 160°-170° | 170°-180° |
|---|---|---|---|---|---|---|---|---|
| 0.130 lm | 0.113 lm | 0.106 lm | 0.096 lm | 0.037 lm | 0.000 lm | 0.000 lm | 0.000 lm | 0.000 lm |

# Goniophotometry Report

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## Outdoor Light Planning

### Lumen per Zone

| Zone (γ) | Lumen | % Total |
|---|---|---|
| 0-10° | 156 lm | 21.2% |
| 10-20° | 268 lm | 36.4% |
| 20-30° | 196 lm | 26.7% |
| 30-40° | 86 lm | 11.6% |
| 40-50° | 24 lm | 3.2% |
| 50-60° | 4 lm | 0.5% |
| 60-70° | 1 lm | 0.2% |
| 70-80° | 1 lm | 0.1% |
| 80-90° | 0 lm | 0.1% |
| 90-100° | 0 lm | 0.0% |
| 100-110° | 0 lm | 0.0% |
| 110-120° | 0 lm | 0.0% |
| 120-130° | 0 lm | 0.0% |
| 130-140° | 0 lm | 0.0% |
| 140-150° | 0 lm | 0.0% |
| 150-160° | 0 lm | 0.0% |
| 160-170° | 0 lm | 0.0% |
| 170-180° | 0 lm | 0.0% |
| Total | 736 lm | 100.0% |

### Zonal Lumen summary

| Zone (γ) | Lumen | % Total |
|---|---|---|
| 0-30° | 620 lm | 84.2% |
| 0-40° | 706 lm | 95.9% |
| 0-60° | 733 lm | 99.6% |
| 60-90° | 2 lm | 0.3% |
| 70-100° | 1 lm | 0.2% |
| 90-120° | 0 lm | 0.0% |
| 0-90° | 736 lm | 99.9% |
| 90-180° | 0 lm | 0.1% |
| 0-180° | 736 lm | 100.0% |

### Intensity peaks

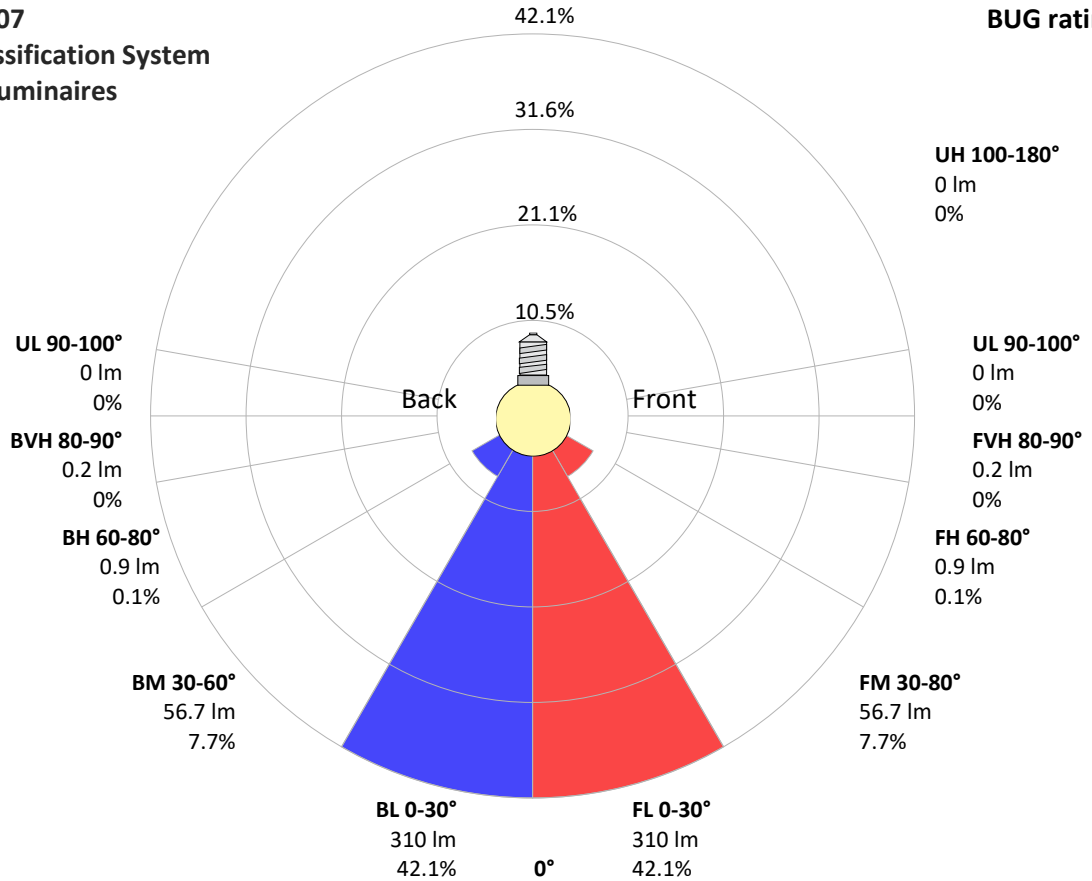
| | |
|---|---|
| Max intensity | 1974 cd |
| Intensity, 90° | 0 cd |
| Intensity, 0° | 1972 cd |

### BUG rating

| | Lumen | % Total |
|---|---|---|
| **Forward light** | | |
| Low(0-30°) | 310 lm | 42.1% |
| Medium(30-60°) | 57 lm | 7.7% |
| High(60-80°) | 1 lm | 0.1% |
| Very high(80-90°) | 0 lm | 0.0% |
| **Back light** | | |
| Low(0-30°) | 310 lm | 42.1% |
| Medium(30-60°) | 57 lm | 7.7% |
| High(60-80°) | 1 lm | 0.1% |
| Very high(80-90°) | 0 lm | 0.0% |
| **Uplight** | | |
| Low(90-100°) | 0 lm | 0.0% |
| High(100-180°) | 0 lm | 0.0% |

## IESNA TM-15-07
## Luminaire Classification System
## For Outdoor Luminaires

**BUG rating B1 U1 G0**



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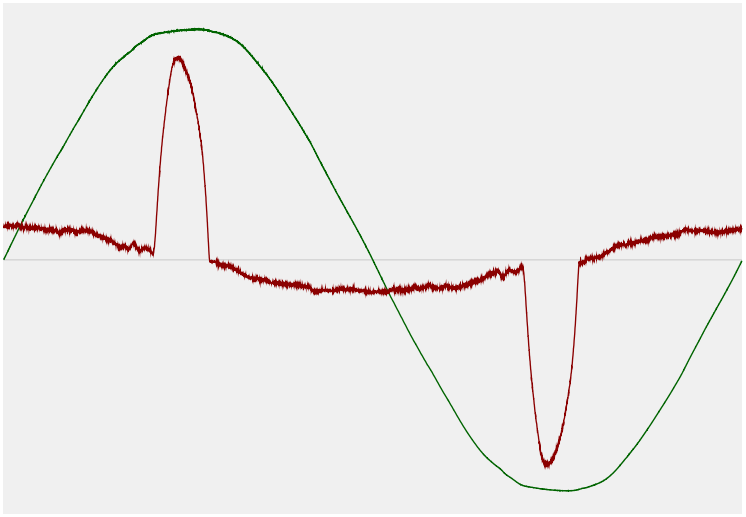
## Power Details

### Input Power

| | |
|---|---|
| Power feed to light source | 14.6 W |
| Frequency of input power | 50 Hz |
| RMS Input voltage feed, $V_{RMS}$ | 243 V |
| RMS Input current feed, $I_{RMS}$ | 0.127 A |
| Volt-Ampere or apparent power = $V_{RMS}$*$I_{RMS}$ | 30.84 VA |
| Displacement factor of AC power feed | 0.78 |
| Power factor of AC current feed | 0.47 |
| Total harmonic distortion of the current | 130.1% |
| Total harmonic distortion of the voltage | 1.33% |

### Input Power Curve



### Efficiency

Radiated power efficiency 18.5%

Lumen efficiency 50 lm/W

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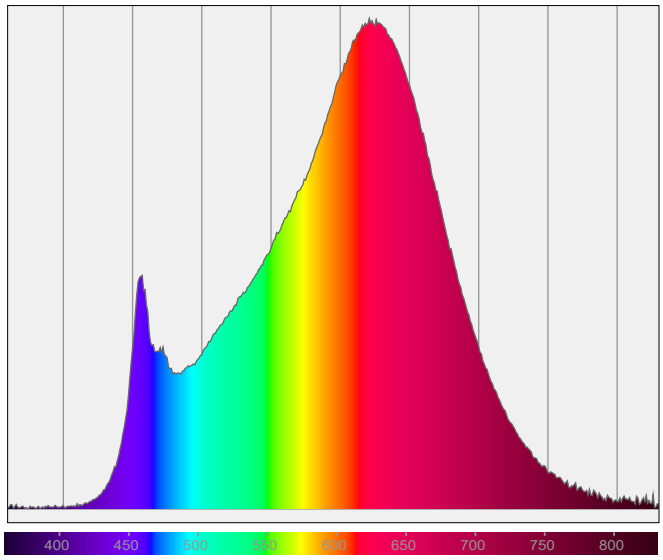
## Color Measurements

| | |
|---|---|
| Correlated Color Temperature | CCT = 2700 K |
| Color Rendering TM30-18 | $R_f$ 91.5 – $R_g$ 98.9 |
| Color Shift, CIE duv | Duv ±0.0003 |

## Spectral distribution




## Color details

| | | | |
|---|---|---|---|
| Correlated Color Temperature | CCT = 2700 K | Color coordinates CIE 1931 | (x;y) = (0.460;0.411) |
| Color Rendering Index | CRI 93.0 | Color coordinate CIEs 1960 | (u;v) = (0.263;0.352) |
| Color Rendering Index, R9 (red component) | R9 = 68.0 | Color deviation from BBL | Duv = ±0.0003 |
| Color Rendering TM30-18 | $R_f$ 91.5 – $R_g$ 98.9 | Color coordinate CIEs 1976 (CIELUV) | (u';v') = (0.263;0.263) |
| Color Quality Scale | CQS = 90.9 | | |

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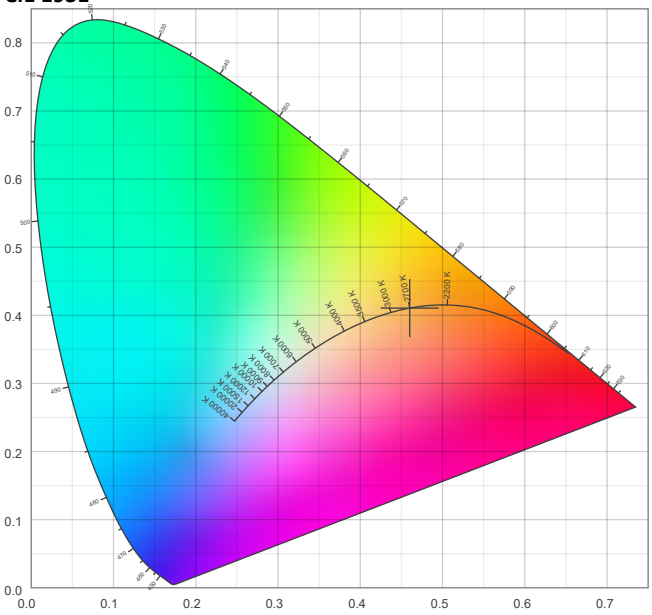
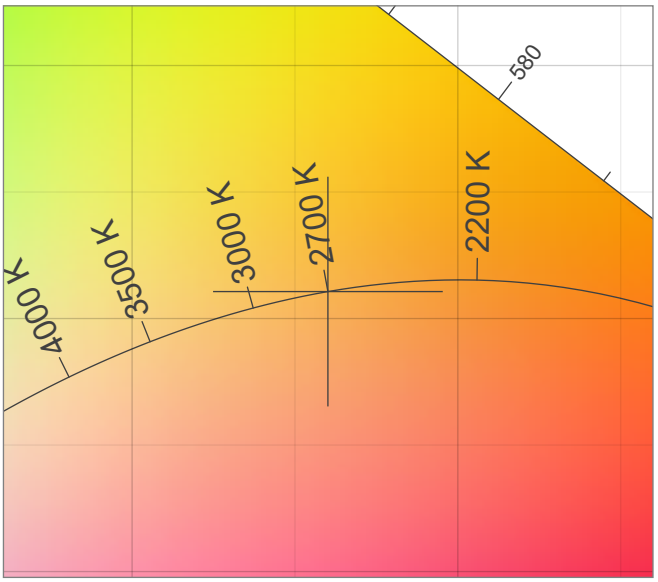
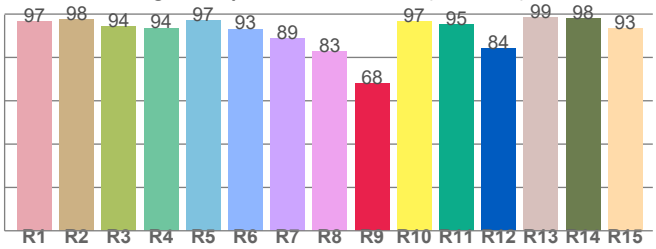
### CIE 1931



### CIE 1931 – zoomed on Planckian locus



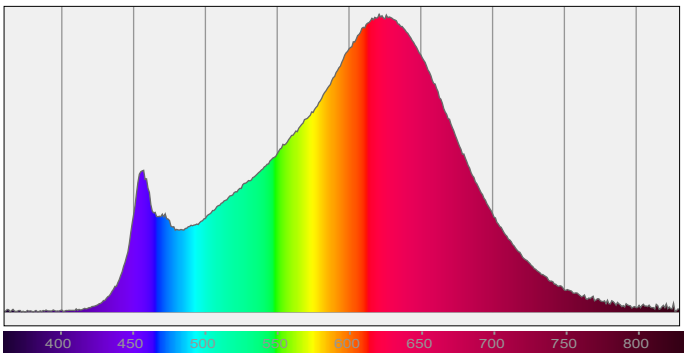

### Color Rendering Index per reference color (CIE 1995)



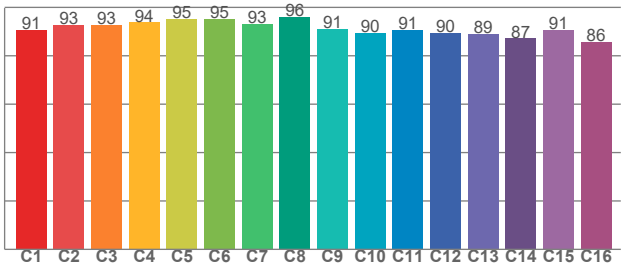

CRI R values, only R1-R8 are used to calculate final CRI value

| R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 | R11 | R12 | R13 | R14 | R15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 96.8 | 97.6 | 94.4 | 93.6 | 97.1 | 93.2 | 88.8 | 82.8 | 68.0 | 96.6 | 95.1 | 84.0 | 98.7 | 98.0 | 93.4 |

### Spectral power distribution (SPD) / W/nm – 0-100%



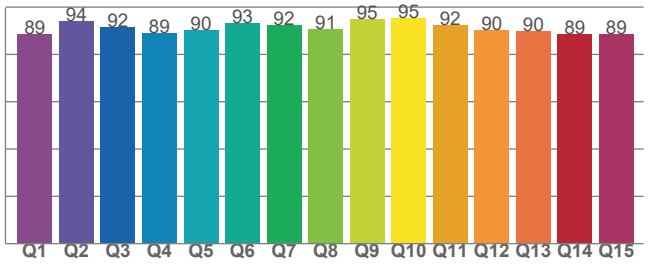

### TM30-18 Rf-values per hue bin




TM30 C values, 16 binned values out of total of 99 C values

| C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 | C16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90.6 | 92.7 | 92.6 | 93.7 | 95.2 | 95.2 | 93.2 | 95.9 | 91.1 | 89.5 | 90.7 | 89.5 | 88.8 | 87.2 | 90.8 | 85.7 |

### Color Quality Scale by reference color




CQS Q values

| Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 88.7 | 93.9 | 91.6 | 88.9 | 90.3 | 93.2 | 92.3 | 90.5 | 94.8 | 95.3 | 92.5 | 90.4 | 89.7 | 88.5 | 88.5 |